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Micronews: mobile application to support children with microcephaly

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Introduction

Microcephaly is a health condition characterized by malformation of the newborn's brain, which causes its inadequate development and has a head circumference with a smaller measurement when compared to other babies of the same age and sex.[1] The measures adopted by the World Health Organization (WHO) are characterized by a head circumference >2 standard deviations (SD) below the reference value when compared to other children; for boys, the measure was equal to or less than 31.9 cm and for girls, the measure was equal to or less than 31.5.

In 2015, there was an outbreak in Brazil caused by the Zika Virus, which caused an increase in the number of children with microcephaly. Since then, several studies have been developed in order to better investigate what has come to be called Congenital ZikaV Syndrome (SCZV), which causes, in addition to microcephaly, changes in child neurodevelopment. Through these studies, brain calcifications, motor, cognitive and visual changes have been identified, these being of a neurological nature, since this virus has an affinity for the nervous system.[2–4]

Furthermore, it is known that infection by the Zika virus can occur at any time during pregnancy in order to cause damage to the development of the fetus. A causal relationship between infection and microcephaly is perceived, in which microcephaly is identified as the clearest consequence of SCZV, whether or not accompanied by other neurological abnormalities.[5]

The moment of receiving the diagnosis of microcephaly can be very delicate; both the way the diagnosis is given and the professional's conduct are of great importance for parents to better understand and accept the diagnosis received, which can be facilitated if there is an interaction developed between the health professional and the child's parents.[6]

As for their parents, on the other hand, after receiving the diagnosis, they begin their journey in search of causal explanations and therapeutic responses for the diagnosis of SCZV and focus on daily care, consultations and therapeutic follow-up, always in search of well-being. of your child. In practice, mothers feel overwhelmed by having to divide themselves into multiple tasks, with the obligation to take care of the house, children, accompany the child in consultations and therapies.[7]

From a maternal and professional perspective, it is seen that there is a very large demand and insufficient supply to supply the need for access to health care for these children; thus, mothers constantly felt overwhelmed and saw the need for a more welcoming service in order to minimize the impact.[8] However, health professionals are not always able to follow the dimension of suffering and the context of life of these families, and thus the creation of health care and education applications are seen as a great resource for caregivers to have greater knowledge in the care they are undergoing being demanded of children.[9]

When observing this whole context, a gap was noticed in which a large number of children with microcephaly are seen, overworked parents and difficulty in accessing health resources; thus, the need for resources that can assist parents in daily care for the child with microcephaly is highlighted. Therefore, the present study aimed to create a mobile application to generate health education and manage the health care of children diagnosed with microcephaly by Zika Virus.

Methodology

Study design

It is a technological production research for the development of a mobile application, through scientific rigor. It was based on a descriptive exploratory opinion survey, of a qualitative nature, in the form of a questionnaire, applied to those responsible for patients diagnosed with microcephaly.

Ethical issues

This study is an addendum to a broader research, approved by the Research Ethics Committee Involving Human Beings at the Federal University of Sergipe (CEP / UFS) under the number CAAE 80424617.8.0000.5546.

Study setting

The questionnaire was applied face-to-face at the outpatient clinics at the University Hospital (HU) of the Federal University of Sergipe (UFS) with the prior authorization of the person in charge of the sector. It was also made available online on the Google Forms® platform (Google Docs®) and disseminated on social networks (Instagram®, Facebook® and WhatsApp®).

Participants

The target population of this study were those responsible for patients who were diagnosed with microcephaly and who were undergoing consultation and / or therapeutic follow-up at the HU

facilities. This research also covered, online, others responsible for children diagnosed with microcephaly, in addition to the HU environment. 139 adults voluntarily participated in the research in the position of responsible for children diagnosed with microcephaly, these being mothers, fathers and grandparents, who were willing to participate in a voluntary and consented way.

Questions were asked that covered the sex and age of the participants, the child's age, family income, access to a smartphone and what was the operating system of the same, the frequency of use of the equipment, whether they already used and / or would use an application to manage the factors of microcephaly, what features are most important to have in the application and whether they would be willing to invest in the MicroNews application.

All responses were tabulated in a database in Excel®; for the analysis and descriptive statistics, the Bioestat® program was used. After analyzing the data, scientific data were collected to support the application, which was developed in partnership with the Computing department of the Federal University of Sergipe.

Study design

Regarding the creation of the application, it was developed in partnership with a systems analyst who made himself available to collaborate with this project, receiving specific guidance from the specialist teacher in the area. Periodic meetings were held with the aim of discussing the content and choosing the language in which the application was developed. All adjustments were made according to the needs and objectives of the research; based on the field research carried out previously. It is noteworthy that this study was developed without recourse or financial support from third parties.

For the scientific basis of the application, a literature review was carried out with a focus on the main information to be inserted in the mobile application; therefore, all theoretical material provided in the application was extracted from a secure scientific source. The literature review was carried out in the main scientific databases in the health field, in order to reveal the state of the art as well as extract relevant information to scientifically support the application.

The search for priority and technological prospection was carried out on the basis of national and international patents, as well as in the two main application stores of the two most popular mobile operating systems (Google Play® and Apple Store®), in order to find support solutions microcephaly and child health support available in software markets. After the search, no application was found that resembled the proposal of this work, as well as no software record was found in a way that would prevent the further development of the application.

The choice of software engineering as well as the language of the system was at the suggestion of the system analyst partner of the project; Flutter was used as a framework for mobile application, while to maintain the database, Firebase was used, and for version control, Github was chosen. The layout and design were chosen and improved during the meetings throughout the product development.

Criteria for application use

To make use of the application, the following criteria will be followed:

a. Inclusion criteria: all those responsible for children diagnosed with microcephaly, who have a smartphone with internet access and agree with the terms of use of the application;

b. Exclusion criteria: non-literate parents or any question that significantly influences the usability of the application.

Results and discussion

Technological profile

Based on the data collected from the questionnaire, in which 138 individuals in the position of responsible for children diagnosed with microcephaly participated, it was possible to recognize the technological profile and their preference regarding the application's functionalities.

Most of those responsible have ages between 20 and 29 years, equivalent to 42.8% (N=59) of the answers obtained; in relation to the children's age, it was seen that 41.3% (N=57) are 4 years old or older. There is a greater proportion of females 97.1% (N=134) when compared to males 2.9% (N=4). Regarding monthly family income, it was observed that 52.9% (N=73) receive a minimum wage of R $ 1,900.00.

Questions were asked about the technology, so that it could be understood what the users' needs were. When asked how important an application would be to support the care of these children, 84.1% (N=116) consider it very important. The operating system prevalent among the participants was Android, equivalent to 87% (N=120) of the responses, in which 94.9% (N=131) makes frequent use equivalent to several times a day.

An investment opportunity was noticed in an application for microcephaly care, since 97.6% (N=136) of the people stated that they do not use any application for this purpose. The most requested feature was to monitor the child's progress, being highlighted by 29.7% (N=41) of the participants; 96.4% (N=133) were interested in the application and said they would use it. If there was a charge for using the application, 31.2% (N=43) believe that the fairest value is between R$ 9.00 and R$ 10.00.

Creating the application

After the first stage, the main functionalities to be implemented in the application were listed, according to the users' requests.

A prototype of the application was made by an application developer, based on the data collected in the field research, this being a collaborative work developed jointly between the researchers and the application developer. At first, an independent and restricted access application was created, only for the purposes of this development phase; after the tests, adjustments and improvements, the application will be made publicly available for use.

For the scientific basis of the application, a review of the current scientific literature was carried out, in order to provide quality scientific knowledge in an accessible language, thus generating health education for users. Content related to motor development, language development, good nutrition, as well as content for motor, auditory, speech and language stimulation, recreation tips and dietary tips were extracted.

Research in reliable scientific literature is necessary for applications to be made available to society that are based on safe and reliable information, considering that the misuse can generate the worsening of the user's health.[10]

The MicroNews application was created with the aim of generating health education and managing daily care for children diagnosed with

microcephaly by Zika Virus; has specific features for the needs of these children, so that it is possible to follow their evolution. When starting the application, the user is faced with the login screen, in which it is requested to create a new account, enter an existing account or recover the user's password. After logging in, the user can view a menu on the left side, giving access to the main functionalities of the application, as shown in Figure 1.

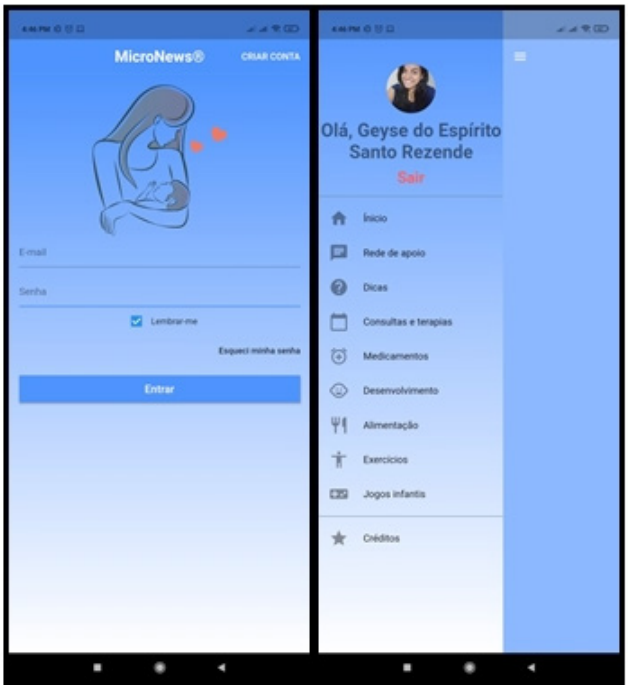

Figure 1 MicroNews - Home screen and side menu.

On the opening screen, a timeline with child development milestones organized by age was displayed, the first months being shown one by one, and from the first year onwards, organized every 3 months of life. These developmental milestones were based on normal child development, so that the knowledge of parents is expanded to the points that can be stimulated with greater intensity, as well as to assist in monitoring the child's progress.

At each milestone that is marked by the user, an emotional support message pops up on your screen to generate a positive reinforcement in the form of encouraging care and daily stimulation at home. Also on this first screen, the emergency call function was placed, which gives access to the user's cell phone call, directing the dial to the number of the Mobile Emergency Service (SAMU) to be used in cases of convulsive crisis or some other urgency with the child, as shown in Figure 2.

Positive reinforcement is seen within psychology as a motivational factor for behavior change and is considered an effective tool in the pursuit of implementing healthy habits. According to the Theory of Behaviorism, positive reinforcement can provide an improvement in the individual's behavior, in a way that positively influences that person to reach the proposed objective.[11–13]

The Support Network comes as a resource to support users, with the freedom to exchange messages and photos between them, in a virtual and secure environment so that they can exchange information and tips with each other, making it possible to give and receive support. emotional. The messages are identified with the user's name and photo, as well as the day and time the message was sent, as can be seen in Figure 3.

Studies focused on this theme reveal that the support network has a very important role for family members of children with Zika Virus Congenital Syndrome, as it can provide emotional support and collective engagement; family support and friendship with other mothers who have children in the same health condition are highlighted as a coping strategy, since there are so many needs of these families that professional work becomes limited to provide all the support that these mothers need.[13–15]

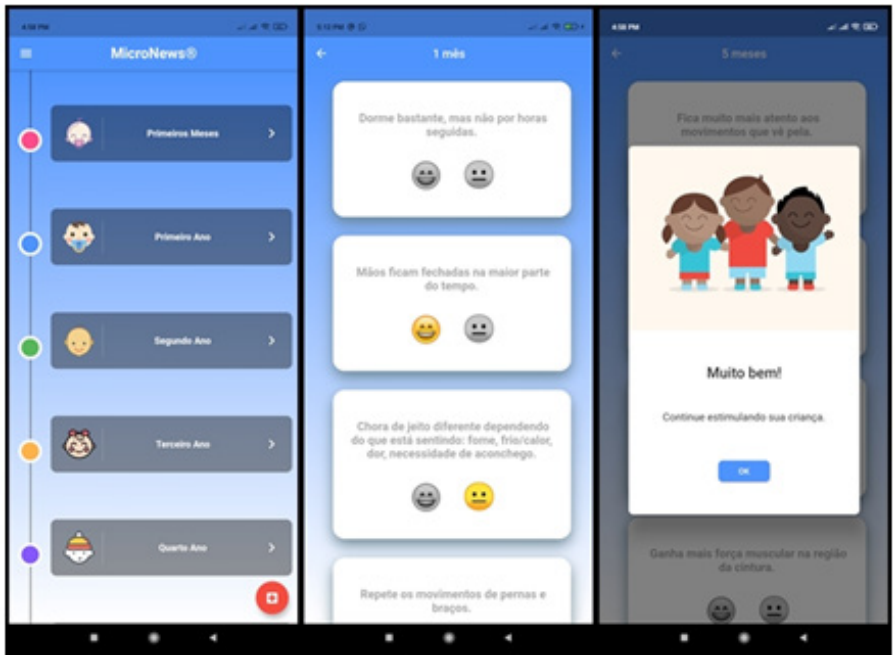

Figure 2 MicroNews - Timeline + SAMU.

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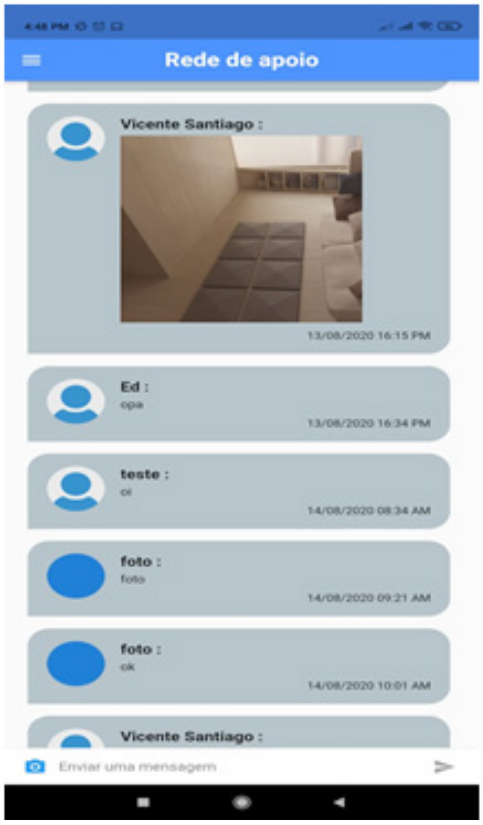

Figure 3 MicroNews - Support network.

In the tips tab, the user can find information regarding Food, Difficulties of everyday life, Sleep disturbance, Stimuli for development and tips for Leisure and recreation. For each item, the user can have access to themes related to these general themes, as shown in Figure 4. It is necessary that family members have quality information on how to deal with the child daily so that the child is given the best possible care. The use of a mobile health application is capable of generating improvements in clinical care, as well as in the promotion of care for those patients; in the view of nursing, an application is effective so that the patient and caregivers acquire knowledge and feel safe in the continuity of treatment in their homes.[16]

The MicroNews application also provides a function for monitoring therapies in consultation, with annotation in the calendar so that the user can organize the information about the place, time and activity that will be performed, so that there is greater organizational control over the treatment schedule medical activities that the child has; as can best be seen through Figure 5.

Certain pathologies require attendance in order to obtain satisfactory results; the frequency in therapeutic follow-up and family support in consultations and therapies is crucial for the development of the patient, since regular attendance allows the formation of the therapist-patient-family bond, in order to cooperate for the evolution of the therapeutic process and provide positive results for the patient.[17,18]

In Figure 6, the function about medicines can be seen, which gives the user the possibility to write down the name, type and dosage of the medicine, as well as the start time and interval between doses to be taken by the child; if the user prefers, it can also activate the reminder mode, so that the application notifies you when the right time for the medication to be taken.

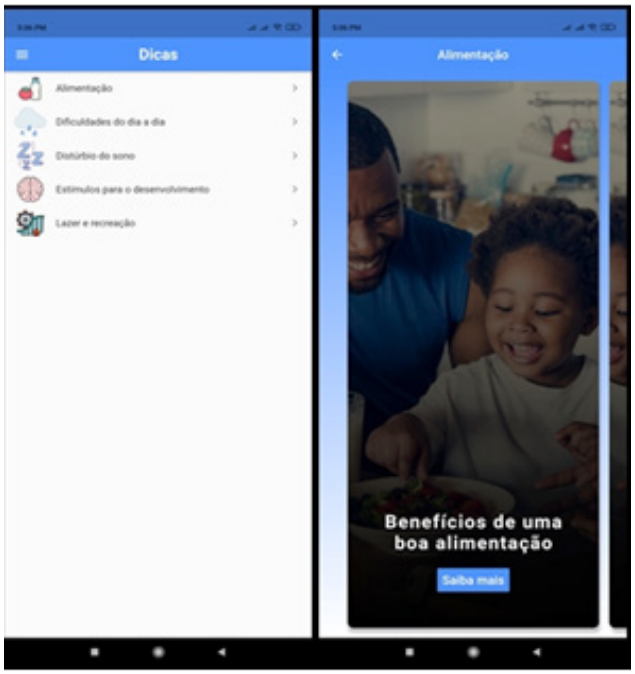

Figure 4 MicroNews - Tips tab.

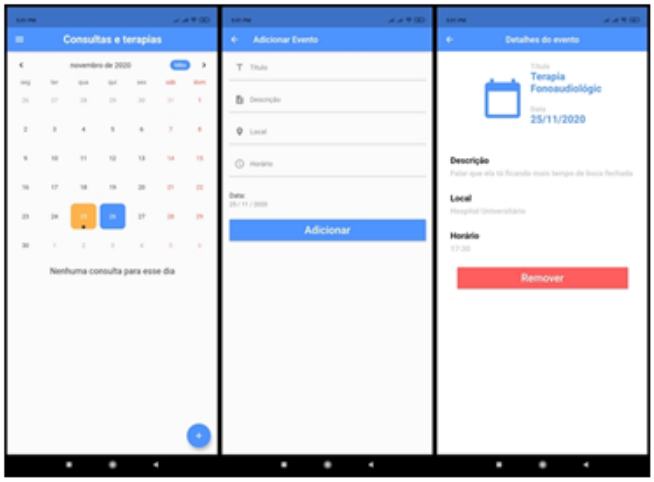

Figure 5 MicroNews - Therapies and Consultations Tab.

Drug data is important to maintain regular treatment. For pharmacists, the use of health apps is beneficial and helps in a healthier lifestyle, being a fundamental part to promote it.[19] For nursing, safe patient care is made up of several types of care, including monitoring the medication in correct dosage and times according to the medical prescription; however, this is a difficulty observed when access to the medication is up to the patient himself, as forgetfulness can occur. So that this does not happen, the implementation of a technology with a focus on safety and continuity of drug therapy becomes an important tool to help patients and their families.[20,21]

One aspect that concerns parents is child development based on their weight and head circumference; in this way, the Child Development tab provides the option for the user to enter data concerning the child's weight and height and the application automatically calculates to inform whether the child is at the ideal weight, below or above the ideal. It also has the option for users to note the diameter of the head

circumference organized according to the measurement date. Both functions can be seen in the form of a list as well as in the form of graphs, as can be better seen in Figure 7.

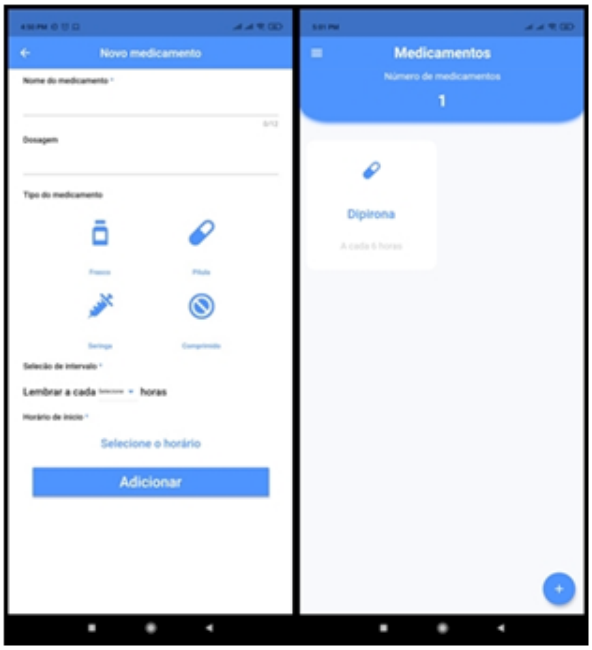

Figure 6 MicroNews - Medicines Tab.

Figure 7 MicroNews - IMC and PC tab.

The anthropometric assessment of children is essential for an adequate monitoring of health conditions to be carried out, in order to identify possible health problems as well as prevent them. Monitoring of BMI and CP can be found in the Child Health Handbook and are health indicators used to monitor children's development.[22]

Since children with a diagnosis of microcephaly, most of them, present significant delays in global development, both the monitoring of nutritional status and the monitoring of head circumference, increase the visibility of their development.[23–25]

The application also provides the user with an exclusive tab for feeding, with a varied list of recommended and non-recommended foods for infant feeding, so that the responsible person can have a source of research at the time of the child's food planning, as well as make a monitoring of the best accepted foods, since it is possible to alternate between the two lists and favor the food that the child accepts in the diet. Figure 8 illustrates what has just been said.

Figure 8 MicroNews - Feed Tab.

Nutritional monitoring, with tips, treatment and counseling to the patient and family, regardless of the subject's nutritional status, shows positive effects of changes in lifestyle and improvement in the quality of the individual's health.[26]

In the exercise tab, the user can find tips on various aspects concerning the stimulation and motor development of children, such as tips on vicious posture, benefits of physiotherapy and examples of physical stimulation to be done in the comfort of their own home. You can select any of the exercise options so that the details are displayed, and you can also share the content. Figure 9 exemplifies what was said earlier. ZikaV has a neurological affinity and severely affects the mobility, tone and posture of children with this diagnosis. Early stimulation and physical therapy monitoring is able to minimize changes in motor functions, in order to provide better neuropsychomotor development and autonomy for the child.[27]

The user also finds MicroNews options for children's games, such as coloring games, memory games, puzzle games and relating shapes and colors; these games are suitable for early childhood and can be used as a great resource for visual and cognitive stimulation. These categories of games direct the user to the SmartKids website, which is a website that offers games to work on the motor and cognitive abilities and functions of children. The tab can be seen in Figure 10.

For the child who has some developmental delay, the naturalness of the game may be compromised, in order to cause losses in daily life; thus, early stimulation through play, whether done by parents, caregivers or professionals, aims to facilitate neuropsychomotor development, promote the development of cognitive skills, reasoning ability and stimulate independence, in order to minimize limitations functional aspects of that child. The way of socializing during play makes the child create bonds of relationship with the adult who accompanies him in that task and the environment that the child lives

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with and the resources used there can be considered useful tools to offer various stimuli for their development.[28,29]

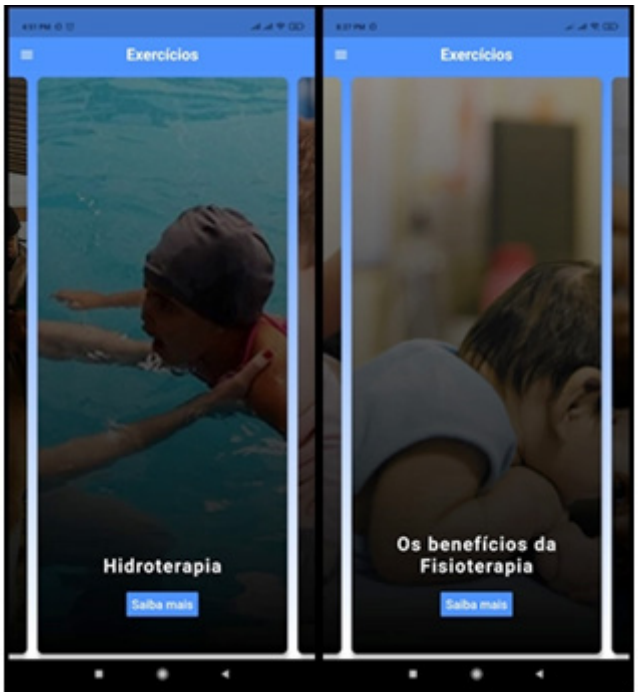

Figure 9 MicroNews - Exercise Tab.

Figure 10 MicroNews - Children's Games Tab.

Within speech therapy, play is an effective and natural way to stimulate language development; it is possible to observe positive impacts after stimulation through playful games, in which the child can respond in the form of imitation, imitation of speech and even show communicative intent. The mediation of an adult is important as a facilitator and model to be followed by the child.[30,31]

Conclusion

The proposed application was developed to be a digital environment for monitoring the child health of children diagnosed with microcephaly; it offers quality scientific knowledge, in a language accessible to users so that health education can be developed. MicroNEWS has health information, tips, a support network between parents and spaces for records regarding child development; in this way it will be possible to promote knowledge and manage the activities concerning the daily care of the child, as well as to maintain a support network between parents and caregivers who live the same experience.

The entire application was designed based on the issues highlighted in literature as also noted through the user's profile search. It should be noted that efforts were directed towards the gains in quality of life of children with this diagnosis, since microcephaly requires constant and comprehensive care and parents and children do not always have the necessary support they need.

In summary, it is worth mentioning that the technological resource exposed here will be an informational and health management tool, in which it will be possible to monitor the development and record important data on children's routine and has the potential to assist in the care of these children. In order to know the effectiveness of the application, it is possible that future research will be carried out to expose users' feedback, in order to understand the point of view of both the public and professionals.

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Conflicts of interest

The author declares that there is no conflict of interest.

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